## Remarks

The Claim Amendments

Independent method claims 1 and 9 are amended to more clearly recite the invention. Dependent claims 5-8 have been cancelled as unnecessary in view of the additions to claim 1.

Line 2 of claim 1 has been amended to state that the recited method forms a droplet of weld metal on a welding electrode and separates the droplet from the electrode in a globular transfer mode in an arc welding process. This addition simply emphasizes what the three steps of the claim already require. Line 2 of claim 9 has been amended in the same way for the same reason. The penultimate line of original claim 9 stated that the droplet of welding material was separated from the electrode in a globular mode. Paragraphs 0007-0010 and 0020-0022 teach the recited processes for independent claims 1 and 9 for forming and transferring a single droplet of weld material from a welding electrode to the workpiece with each double pulse cycle.

Claims 1 and 9 have also been amended to recite that the first direct current pulse (e.g. current level 202 in Figure 2) is additive to the background current flow (200 in Figure 2) and that the second pulse (204 in Figure 2) is additive to the first current pulse (202).

As recited in the independent claims, the background direct current flow establishes the arc of current between the welding electrode and the workpiece. The first pulse, imposed on top of the background current (paragraph 0009) at a current flow level greater than the background current, is used to form the droplet of welding material on the electrode. The second pulse, imposed on top of the first pulse (paragraph 0009) at a current level greater than the first pulse level, is used to separate the droplet from the electrode for transfer in the arc to the workpiece. The droplet is transferred in the arc to the workpiece, it is not already contacting the workpiece in a short-circuit. The practice of the method utilizes two pulses of predetermined intensity and timing to repeatedly deliver a single uniform droplet of weld material in the arc per welding cycle time period.

Original dependent claims 2 and 10 recite that the background current is continued and the first and second current impulses are repeated to sequentially form and transfer individual droplets of weld material (globular mode) to form the desired weld material in a workpiece. Original dependent claims 3 and 11 recite that the duration of each first pulse (droplet forming period) is less than half of the welding cycle time period. Original dependent

claim 4 and currently amended dependent claim 12 recite that the duration of each second pulse (droplet separation period) period is shorter than the first pulse period.

Dependent claim 12 has been amended to further recite that the magnitude of the current flow in the second pulse is more than twice the magnitude of the first current pulse (for example, 800 amperes compared to three hundred amperes as disclosed in paragraphs 0009 and 0021 and in Figure 2).

The Claim Rejections

Claims 1, 2, 9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by the Japanese document no. JP61-115680A.

Claims 3-4, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Japanese document no. JP61-115680A.

Claims 1, 2, 9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by the British document no. GB2171267A.

Claims 3-4, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over the British document no. GB2171267A.

The Examiner is respectfully requested to reconsider and remove each of these claim rejections for the following reasons.

The Japanese Document, JP61-115680A

The English language abstract of this document is very short and the drawing figures are hard to interpret without access to the full supporting text. However, the abstract text and drawing show that the disclosure pertains to arc welding using a short-circuit mode of metal transfer. In this mode the welding current is controlled so that the molten droplet formed on the electrode tip grows until it touches the underlying weld puddle. The contact by the large droplet between the electrode tip and the pool of weld metal laying on the workpiece forms a low resistance electrical circuit (a short-circuit) between the weld electrode and the workpiece. Figures 2, 4, and 5 of the Japanese document seem to illustrate the formation of the short-circuiting droplet between an electrode and workpiece as Figures 1, 3, and 8(a) and 8(b) show current peaks $I_{P1}$ and $I_{P2}$. But the current peaks in the Japanese disclosure of short-circuit welding can't anticipate or suggest Applicant's claimed methods for arc welding by globular

metal transfer. Whatever may be said of the Japanese usage of current peaks, they do not lead to a globular transfer of metal in an arc in the sense of applicants' claimed methods.

Applicants' independent claims 1 and 9 clearly recite a method comprising the combination of establishing an arc between the electrode and weld site with a background current, imposing a first current pulse on top of the background current to form a weld droplet on the electrode tip, and then imposing a second current pulse on top of the first pulse to separate the droplet from the tip and transfer the droplet in the arc to the workpiece. The Japanese document does not contemplate a globular metal transfer process and certainly does not anticipate claims 1, 2, 9, or10. And the Japanese disclosure of $I_{P1}$ and $I_{P2}$, as applied to the short circuited droplet connection between electrode and workpiece, does not teach or suggest the three steps for globular metal transfer recited in Applicants' claims 3, 4, 11, and 12.

The British Document, GB 2171267A

The UK patent application describes, as prior art, a single pulse method of transferring metal from a wire electrode to a workpiece in metal-inert gas welding. But they observe that the method falters when the electrode has a flux core within a metal sheath. Then the metal sheath and flux core detach separately when a single current pulse is employed. So the British use a background current, and two separated pulses to "provide controlled dissolution of composite welding wire (col. 1, lines 63-64)." As described with reference to Figure 2 of the British document, a pulse portion A in the welding current is used. The pulse portion comprises two rectangular pulses in close succession. The pulses each have duration of a few milliseconds and are separated by a similar period (column 2, lines 70-72).

Thus, in accordance with the British disclosure, the pulses are separate. The second pulse is not imposed on top of the first pulse as recited in each of applicants' claims. And the purpose of the distinct pulses in the British process is to combine metal and flux material in a single droplet.

Clearly the British disclosure does not anticipate the processes recited in claims 1, 2, 9, and 10 and it does not suggest the processes recited in claim 3, 4, 11, and 12.

The rejections of claims 1-4 and 9-12 should be removed and this case passed to issue.

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